RECEIVED
CENTRAL FAX CENTER
FEB 14 2008

Due Date: February 14, 2008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	
Inventors: Hugues Marchand et al.	Examiner: Matthew J. Song
Serial #: 09/922,122	Group Art Unit: 1722
Filed: August 3, 2001	Appeal No.: ________
Title: METHOD OF CONTROLLING STRESS IN GALLIUM NITRIDE FILMS DEPOSITED ON SUBSTRATES	

BRIEF OF APPELLANTS

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In accordance with 37 C.F.R. §41.37, Appellants' attorney hereby submits the Brief of Appellants on appeal from the final rejection in the above-identified application as set forth in the Office Action dated May 14, 2007.

Please charge the amount of $510.00 to cover the required fee for filing this Brief as set forth under 37 C.F.R. §41.20(b)(2) to Deposit Account No. 50-0494 of Gates & Cooper LLP. Also, please charge any additional fees or credit any overpayments to Deposit Account No. 50-0494.

I. REAL PARTY IN INTEREST

The real party in interest is The Regents of the University of California, the assignee of the present application.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences for the above-referenced patent application.

III. STATUS OF CLAIMS

Claims 1, 2, 4-9, 11-35, and 38 are pending in the application

Claims 3, 10, 36-37 and 39 have been cancelled.

Claims 18-34 have been withdrawn from consideration.

Claims 1-2, 4-9, 15-1 7, 35 and 38 were rejected under 35 U.S.C. §102(e) as being anticipated by Tischler et a1 (U.S. Patent No. 6,765,240).

Claims 11-14 were rejected under 35 U.S.C. §103(a) as being obvious over Tischler et al. (U.S. Patent No. 6,765,240) as applied to claims 1-2, 4-9, 15-17,35 and 38 above, and further in view of Redwing et al. (U.S. Patent No. 5,874,747).

Claims 1, 2, 4-9, 11-17, 35 and 38 are being appeal.

IV. STATUS OF AMENDMENTS

No amendments have been made subsequent to the final Office Action.

V. SUMMARY OF THE INVENTION

Appellants' invention as recited in independent claim 1 is directed to a semiconductor film (100), comprising a silicon substrate (104) and a single graded gallium nitride layer (102) deposited on the silicon substrate (104) having a varying composition of a substantially continuous grade from an initial composition (106) to a final composition (108) and a net compressive stress. (See, e.g., page 7, line 15 to page 8, line 17 referring to 100, 102, 104, 106 and 108 in FIG. 1.)

Appellants' dependent claim 2, which is dependent on claim 1, recites that the graded gallium nitride layer (102) is deposited using metalorganic chemical vapor deposition (MOCVD). (See, e.g., page 5, line 18 to page 6, line 15.)

Appellants' dependent claim 4, which is dependent on claim 35, recites that the graded gallium nitride layer (102) is deposited by changing a vapor pressure (120) of the supply of at

least one precursor (110) in a growth chamber (112) for the graded gallium nitride layer (102). (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102, 110, 112 and 120 in FIG. 1.)

Appellants' dependent claim 5, which is dependent on claim 35, recites that the precursor (110) is gallium, aluminum or nitrogen. (See, e.g., page 8, lines 8-17 referring to 110 in FIG. 1.)

Appellants' dependent claim 6, which is dependent on claim 35, recites that the graded gallium nitride layer (102) is deposited by changing a parameter (122) of the growth chamber (112) for the graded gallium nitride layer (102). (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102, 112 and 122 in FIG. 1.)

Appellants' dependent claim 7, which is dependent on claim 6, recites that the parameter (122) of the growth chamber (112) is a total pressure, a temperature of the substrate (102), a total flow, a rate of substrate (104) rotation or a reactor wall temperature. (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 104, 112 and 122 in FIG. 1.)

Appellants' dependent claim 8, which is dependent on claim 35, recites that the graded gallium nitride layer (102) is deposited by changing the geometry of the growth chamber (112) for the graded gallium nitride layer (102). (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102 and 112 in FIG. 1.)

Appellants' dependent claim 9, which is dependent on claim 8, recites that changing the geometry of the growth chamber (112) comprises moving the silicon substrate (104) relative to injectors of the growth chamber (112). (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102 and 112 in FIG. 1.)

Appellants' dependent claim 11, which is dependent on claim 1, recites that the initial composition (106) comprises substantially at least a 20% aluminum composition. (See, e.g., page 7, line 15 to page 8, line 31 referring to 106 in FIG. 1.)

Appellants' dependent claim 12, which is dependent on claim 1, recites that the initial composition (106) is aluminum nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises substantially at least 20%. (See, e.g., page 7, line 15 to page 8, line 31 referring to 106 in FIG. 1.)

Appellants' dependent claim 13, which is dependent on claim 1, recites that the final composition (108) comprises substantially less than a 20% aluminum composition. (See, e.g., page 7, line 15 to page 8, line 31 referring to 108 in FIG. 1.)

Appellants' dependent claim 14, which is dependent on claim 1, recites that the final composition (108) is gallium nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises substantially less than 20%. (See, e.g., page 7, line 15 to page 8, line 31 referring to 108 in FIG. 1.)

Appellants' dependent claim 15, which is dependent on claim 1, recites at least one additional layer disposed on the graded gallium nitride layer (102). (See, e.g., page 8, lines 15-17 referring to 102 in FIG. 1.)

Appellants' dependent claim 16, which is dependent on claim 35, recites at least one other element is introduced into the growth chamber (112) for the graded gallium nitride layer (102) causing no abrupt variations in the varying composition of the graded gallium nitride layer (102). (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102 and 112 in FIG. 1.)

Appellants' dependent claim 17, which is dependent on claim 16, recites that the other element is silicon, indium or arsenic. (See, e.g., page 5, line 18 to page 6, line 15; and page 8, lines 8-17 referring to 102 and 112 in FIG. 1.)

Appellants' dependent claim 35, which is dependent on claim 1, recites that the graded gallium nitride layer (102) is formed from a supply of at least one precursor (110) in a growth chamber (112) without any interruption in the supply. (See, e.g., page 5, line 18 to page 6, line 15; and page 7, line 15 to page 8, line 17 referring to 102, 110 and 112 in FIG. 1.)

Appellants' dependent claim 38, which is dependent on claim 1, recites that the graded gallium nitride layer (102) has a net stress below a stress required for crack generation in the graded gallium nitride layer (102). (See, e.g., page 5, line 18 to page 6, line 15; and page 7, line 15 to page 8, line 7 referring to 102 in FIG. 1.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1-2, 4-9, 15-1 7, 35 and 38 are anticipated under 35 U.S.C. §102(e) by Tischler et al (U.S. Patent No. 6,765,240).

2. Whether claims 11-14 are obvious under 35 U.S.C. §103(a) over Tischler et al. (U.S. Patent No. 6,765,240) as applied to claims 1-2, 4-9, 15-17,35 and 38 above, and further in view of Redwing et al. (U.S. Patent No. 5,874,747).

VII. ARGUMENTS

A. Arguments directed to the first grounds of rejection: Whether claims 1-2, 4-9, 15-17, 35 and 38 are anticipated under 35 U.S.C. §102(e) by Tischler et al (U.S. Patent No. 6,765,240).

1. Independent Claim 1

Appellants' independent claim 1 recites a semiconductor film, comprising: a silicon (Si) substrate; and a single crystal graded gallium nitride (GaN) layer deposited on the silicon substrate having a varying composition of a substantially continuous grade from an initial composition to a final composition and a net compressive stress.

The Office Action asserts that Tischler teaches all the elements of Appellants' independent claim 1. However, the fundamental concept in Tischler is the growth of epitaxial layers of GaN (in the broad sense, i.e. M*N) at the customary growth temperature (e.g. 1000°C) followed by immediate removal of the substrate (by chemical etching) without cooling down the structure to room temperature. Because the substrate is present only at the growth temperature (or close to it), the structure would not inherently have a net compressive stress.

In Tischler, removing the substrate at high temperature essentially eliminates the problem of thermal expansion mismatch between the epitaxial layers and the substrate, so it is to be expected that the resulting "free-standing" M*N films are free of stress-related defects. However, Tischler does not teach or suggest a solution to the problem of thermal stress management for a "conventional" substrate-film stack, as does Appellants' invention.

Consider, for example, the following statement made on page 3 of the Office Action:

> Also, Tischler et al disclose single crystal has no defects from thermal coefficient of expansion differences, i.e. cracks (col 12, ln 45-65 and col 13, ln 1-5), which is further evidence that there is a net compressive stress because Appellants' teach that crack free graded GaN has a net compressive stress, note page 8, lines 1-10 of the specifications.

The first underlined portion of the statement is incorrect. In Tischler, the substrate is removed at high temperature (Tischler generally recommends that the substrate be removed within 300°C of the growth temperature), and therefore there is no substrate present when the cool-down to room temperature begins. As a result, the epitaxial film (which would then be a free-standing layer) is not subject to thermal expansion mismatch, and the resulting stress should be approximately zero.

The second underlined portion of the statement is also incorrect. A GaN layer deposited on a Si substrate has a net compressive stress after the structure has cooled down. The Office Action erroneously infers that the resulting free-standing GaN films in Tischler also have a net compressive stress, when in fact they should be stress-free.

Thus, the Office Action errs when it asserts that Tischler discloses a semiconductor film comprising all of the claimed structural features of Appellants' invention. Appellants' independent claim 1 comprises a single crystal graded GaN layer deposited on a Si substrate and having a net compressive stress, whereas Tischler's end product, comprising only the epitaxial film with no substrate, has no net compressive stress.

Nonetheless, the Office Action maintains, without any evidence, that Tischler's intermediate product, with both the epitaxial film and substrate present at or near the growth temperature, exhibits a net compressive stress at a high temperature. According to the Office Action, Tischler's intermediate product is still subject to compressive strain due to elastic energy associated with the lattice mismatch of materials (the Office Action also asserts that Tischler's end product is subject to compressive strain due to this elastic energy, notwithstanding the removal of the substrate). Consequently, according to the Office Action, Tischler's intermediate product, at the higher temperature and before the cool down process which induces tensile stress, has a net compressive stress.

Appellants' attorney disagrees with this analysis. First, Appellants' attorney notes that none of the references support this analysis; indeed, nowhere does the Office Action cite any references in support of this analysis. Instead, the Office Action refers only to Appellants' specification at paragraph [0025].

However, the citation by the Office Action to Appellants' specification is unpersuasive, because paragraph [0025] states the following:

> **[0025]** The principal feature of the present invention is that the composition is varied continuously between the initial composition 106 and the final composition 108 without any interruption in precursor 110 supply. From ongoing materials studies it appears that the lack of interruption in the growth process prevents the layers with low aluminum content from dissipating the elastic energy associated with the lattice mismatch between material A and material B. Thus a larger amount of compressive strain is present in the layer structure than is found when using other methods. In many cases the compressive stress is large enough to counterbalance the tensile stress induced by the cool-down procedure such that the net stress in the epitaxial layers is compressive. Compressively-strained films do not crack, hence preserving the properties of any device that may have been subsequently deposited and processed.

Nothing in the above paragraph supports the conclusion that there is a net compressive stress in Tischler's intermediate product at the growth temperature. Consequently, the Office Action's assertion that Tischler's intermediate product discloses Appellants' claimed invention is without basis.

Redwing fails to overcome the deficiencies of Tischler. Recall that Redwing was cited only against dependent claims 11-14, and only for teaching the use of a buffer layer when a GaN layer is grown on a lattice mismatched substrate. However, the combination of Redwing and Tischler does not teach or suggest a single crystal graded GaN layer deposited on a Si substrate having a varying composition of a substantially continuous grade from an initial composition to a final composition and a net compressive stress.

Thus, Appellants' attorney submits that independent claim 1 is allowable over Tischler. Further, dependent claims 2, 4-9, 15-17, 35 and 38 are submitted to be allowable over Tischler in the same manner, because they are dependent on independent claim 1, and thus contains all the

limitations of the independent claims. In addition, dependent claims 2, 4-9, 15-17, 35 and 38 recite additional novel elements not shown by Tischler.

2. Dependent Claims 2, 4-9 and 35

With regards to dependent claims 2, 4-9 and 35, the Office Action rejects these claims as follows:

> Referring to claims 2,4-9, and 35, the claims are product by process claims and are not limited to the manipulations of the recites steps, only the structure of the implied steps. Even though product-by-process claims are limited by and defined by the process, determination of the patentability is based on the product itself. If the product in the product by process claim is the same or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113). Tischler et al discloses a semiconductor film comprising all of the claimed structural features of the product.

Appellant's attorney respectfully submits that these claims stand or fall with independent claim 1, and thus are not argued separately.

3. Dependent Claim 15

With regards to dependent claim 15, which recites at least one additional layer disposed on the graded gallium nitride layer, the Office Action asserts that these limitations are disclosed by Tischler, which forms microelectronic structures on the M*N, which include LEDs, lasers, transistors, etc.

Appellant's attorney respectfully submits that this claim stands or falls with independent claim 1, and thus is not argued separately.

4. Dependent Claims 16-17

With regards to dependent claims 16 and 17, which recite at least one other element is introduced into the growth chamber for the graded gallium nitride layer causing no abrupt variations in the varying composition of the graded gallium nitride layer (in claim 16) and the other element is silicon, indium or arsenic (in claim 17), the Office Action asserts that these

limitations are disclosed by Tischler, which shows that the M*N material may be doped with Si and the M*N material may be an AlGaInN compositionally graded compound (col 12, ln 30-45 and col 9, ln 1-15).

Appellant's attorney respectfully disagrees. The cited portions of Tischler merely refer to doping and compositionally graded compounds, but do not teach or suggest introducing one other element into the growth chamber for the graded gallium nitride layer causing no abrupt variations in the varying composition of the graded gallium nitride layer, wherein the other element is silicon, indium or arsenic. Indeed, the cited portions of Tischler make no mention of avoiding abrupt variations in the varying composition.

5. Dependent Claim 38

With regards to dependent claim 38, which recites that the graded gallium nitride layer has a net stress below a stress required for crack generation in the graded gallium nitride layer, the Office Action asserts that these limitations are disclosed by Tischler, which shows that the GaN material has no defects from thermal coefficient of expansion difference.

Appellant's attorney respectfully disagrees. As noted above, Tischler does not teach or suggest a structure similar to Appellant's claimed structure, because Tischler does not teach or suggest a structure that has a net compressive stress, in either the intermediate product or the end product.

B. Arguments directed to the second grounds of rejection: Whether claims 11-14 are obvious under 35 U.S.C. §103(a) over Tischler et al. (U.S. Patent No. 6,765,240) as applied to claims 1-2, 4-9, 15-17,35 and 38 above, and further in view of Redwing et al. (U.S. Patent No. 5,874,747).

Appellants' attorney submits that dependent claims 11-14 are allowable over Tischler and Redwing in the same manner as independent claim 1 above, because they are dependent on independent claim 1, and thus contains all the limitations of the independent claim. In addition, dependent claims 11-14 recite additional novel elements not shown by Tischler and Redwing.

1. Dependent Claim 11

With regards to dependent claim 11, which recites that the initial composition comprises substantially at least a 20% aluminum composition, the Office Action asserts that these limitations are disclosed by Redwing:

> In a method of making gallium nitride, note entire reference, Redwing et al teaches the quality of a GaN layer grown on a lattice mismatched substrate such as Sic or Si is greatly improved when a buffer or transition layer is grown on the substrate prior to growth of the GaN layer (col 4, ln 60-65). Redwing et al also teaches a buffer structure which eliminates cracking comprising a compositionally graded (Al,Ga)N buffer layer between a substrate and a GaN epilayer.
>
> Redwing et al also teaches using a graded buffer layer gradually varies the lattice constant and thermal expansion coefficient from that of AlN to that of GaN (col 18, ln 35 to col 19, ln 25). Redwing et al also teaches using an AlGaN buffer where the Al composition is graded from 1 at the substrate interface to 0 at the GaN interface (col 18, ln 60 to col 19, 10 and col 24, ln 55- 67) to eliminate cracking of GaN epi-layers, this clearly suggests applicant's initial composition is at least 20% aluminum composition and the final composition comprises substantially less than a 20% aluminum composition.
>
> It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tischler et al by using an initial composition rich in Al and a final composition with no Al, as suggested by Redwing et al, to produce a GaN layer free of cracking by reducing lattice mismatch using a graded buffer layer.

Appellant's attorney respectfully submits that this claim stands or falls with independent claim 1, and thus is not argued separately.

2. Dependent Claims 12-14

With regards to dependent claims 16 and 17, which recite the initial composition is aluminum nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises substantially at least 20% (in claim 12), the final composition comprises substantially less than a 20% aluminum composition (in claim 13), and the final composition is gallium nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises

substantially less than 20% (in claim 14), the Office Action asserts that these limitations are disclosed by Redwing:

> Referring to claims 12-14, the combination of Tischler et al and Redwing et al teaches an initial composition of AlN and a final composition of GaN, this clearly suggests applicant's initial composition is at least 20% aluminum composition and the final composition comprises substantially less than a 20% aluminum composition.

Appellant's attorney respectfully submits that these claims stand or fall with independent claim 1, and thus are not argued separately.

IX. CONCLUSION

In light of the foregoing arguments, Appellants' attorney respectfully submits that the cited references do not anticipate nor render obvious the claimed invention. More specifically, Appellants' claims recite novel physical features which patentably distinguish over any and all references under 35 U.S.C. §§ 102 and 103.

As a result, a decision by the Board of Patent Appeals and Interferences reversing the Examiner and directing allowance of the pending claims in the subject application is respectfully solicited.

Respectfully submitted,

GATES & COOPER LLP
Attorneys for Appellants

Howard Hughes Center
6701 Center Drive West, Suite 1050
Los Angeles, California 90045
(310) 641-8797

Date: February 14, 2008

By: GHG

Name: George H. Gates
Reg. No.: 33,500

GHG/

G&C 30794.79-US-U1

CLAIMS APPENDIX

1. (PREVIOUSLY PRESENTED) A semiconductor film, comprising:

a silicon substrate; and

a single crystal graded gallium nitride layer deposited on the silicon substrate having a varying composition of a substantially continuous grade from an initial composition to a final composition and a net compressive stress.

2. (ORIGINAL) The semiconductor film of claim 1, wherein the graded gallium nitride layer is deposited using metalorganic chemical vapor deposition (MOCVD).

3. (CANCELED)

4. (PREVIOUSLY PRESENTED) The semiconductor film of claim 35, wherein the graded gallium nitride layer is deposited by changing a vapor pressure of the supply of at least one precursor in a growth chamber for the graded gallium nitride layer.

5. (PREVIOUSLY PRESENTED) The semiconductor film of claim 35, wherein the precursor is gallium, aluminum or nitrogen.

6. (PREVIOUSLY PRESENTED) The semiconductor film of claim 35, wherein the graded gallium nitride layer is deposited by changing a parameter of the growth chamber for the graded gallium nitride layer.

7. (ORIGINAL) The semiconductor film of claim 6, wherein the parameter of the growth chamber is a total pressure, a temperature of the substrate, a total flow, a rate of substrate rotation or a reactor wall temperature.

8. (PREVIOUSLY PRESENTED) The semiconductor film of claim 35, wherein the graded gallium nitride layer is deposited by changing the geometry of the growth chamber for the graded gallium nitride layer.

9. (PREVIOUSLY PRESENTED) The semiconductor film of claim 8, wherein changing the geometry of the growth chamber comprises moving the silicon substrate relative to injectors of the growth chamber.

10. (CANCELED)

11. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the initial composition comprises substantially at least a 20% aluminum composition.

12. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the initial composition is aluminum nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises substantially at least 20%.

13. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the final composition comprises substantially less than a 20% aluminum composition.

14. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the final composition is gallium nitride or an aluminum content aluminum gallium nitride where the aluminum content comprises substantially less than 20%.

15. (ORIGINAL) The semiconductor film of claim 1, further comprising at least one additional layer disposed on the graded gallium nitride layer.

16. (PREVIOUSLY PRESENTED) The semiconductor film of claim 35, wherein at least one other element is introduced into the growth chamber for the graded gallium nitride layer causing no abrupt variations in the varying composition of the graded gallium nitride layer.

17. (ORIGINAL) The semiconductor film of claim 16, wherein the other element is silicon, indium or arsenic.

18. (WITHDRAWN) A method of producing a semiconductor film, comprising:

providing a substrate; and

depositing a graded gallium nitride layer on the substrate having a varying composition of a substantially continuous grade from an initial composition to a final composition formed from a supply of at least one precursor in a growth chamber without any interruption in the supply.

19. (WITHDRAWN) The method of claim 18, wherein the step of depositing the graded gallium nitride layer comprises using metalorganic chemical vapor deposition (MOCVD).

20. (WITHDRAWN) The method of claim 18, wherein the step of depositing the graded gallium nitride layer produces a graded gallium nitride layer having a net compressive stress.

21. (WITHDRAWN) The method of claim 18, wherein the step of depositing the graded gallium nitride layer comprises changing a vapor pressure of the supply of at least one precursor in a growth chamber for the graded gallium nitride layer.

22. (WITHDRAWN) The method of claim 18, wherein the precursor is gallium, aluminum or nitrogen.

23. (WITHDRAWN) The method of claim 18, wherein the step of depositing the graded gallium nitride layer comprises changing a parameter of the growth chamber for the graded gallium nitride layer.

24. (WITHDRAWN) The method of claim 23, wherein the parameter of the growth chamber is a total pressure, a temperature of the substrate, a total flow, a rate of substrate rotation or a reactor wall temperature.

25. (WITHDRAWN) The method of claim 18, wherein the step of depositing the graded gallium nitride layer comprises changing the geometry of the growth chamber for the graded gallium nitride layer.

26. (WITHDRAWN) The method of claim 25, wherein changing the geometry of the growth chamber comprises moving the substrate relative to injectors of the growth chamber.

27. (WITHDRAWN) The method of claim 18, wherein the substrate is silicon or silicon carbide.

28. (WITHDRAWN) The method of claim 18, wherein the initial composition is a high aluminum composition.

29. (WITHDRAWN) The method of claim 18, wherein the initial composition is aluminum nitride or a high aluminum content aluminum gallium nitride.

30. (WITHDRAWN) The method of claim 18, wherein the final composition is a low aluminum composition.

31. (WITHDRAWN) The method of claim 18, wherein the final composition is gallium nitride or a low aluminum content aluminum gallium nitride.

32. (WITHDRAWN) The method of claim 18, further comprising depositing at least one additional layer on the graded gallium nitride layer.

33. (WITHDRAWN) The method of claim 18, wherein the step of forming the graded gallium nitride layer comprises introducing at least one other element into the growth chamber for the graded gallium nitride layer causing no abrupt variations in the varying composition of the graded gallium nitride layer.

34. (WITHDRAWN) The method of claim 33, wherein the other element is silicon, indium or arsenic.

35. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the graded gallium nitride layer is formed from a supply of at least one precursor in a growth chamber without any interruption in the supply.

36. (CANCELED)

37. (CANCELED)

38. (PREVIOUSLY PRESENTED) The semiconductor film of claim 1, wherein the graded gallium nitride layer has a net stress below a stress required for crack generation in the graded gallium nitride layer.

39. (CANCELED)

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.